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Investigation of the Support of Prominence Material by Magnetic Dips in a Coronal Fluxtube

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The support of prominence material in the solar corona against gravity is strongly believed to through the magnetic tension of dips in the coronal magnetic field. For quiescent prominences, which exhibit many gravity driven flows and instabilities, hydrodynamic forces are non-negligible and so must be included in the study of prominence equilibria. The results presented here look at the 2.5D equilibrium created by adding mass to a flux rope and allowing a magneto-hydrostatic equilibrium to form. Two models are studied in detail, one has a simple o-point configuration with a ratio of the horizontal field (B_x) to the axial field (B_y) of $1:2$ and a more complex model that also has an x-point with a ratio of the horizontal field (B_x) to the axial field (B_y) of $1:11$. The models show that the support against gravity is either pressure support and tension support, with only the tension support models resembling observed quiescent prominences. For all parameter sets, it was found that the o-point of the coronal flux tube was pulled down by the prominence material, leading to compression of the magnetic field at the base of the prominence. Therefore the tension support comes from the small curvature of the compressed magnetic field at the bottom and the larger curvature of the stretched magnetic field at the top of the prominence. The results imply that a plasma β of ~ 0.1 is necessary to support the dense prominence material through magnetic tension.